

SCIENTIFIC SECTION

Review Article

Treatment of hot tar burns

Hot tar burns, although rare, usually occur in workers in the paving and roofing industries. When tar is heated to high temperatures it can cause deep burns, and its removal often causes further damage. However, the use of one of the polysorbates (surface-active agents) makes removal easy and painless.

Bien que rares, les brûlures avec du goudron chaud surviennent habituellement chez les travailleurs du pavage et chez les couvreurs. Chauffé à haute température le goudron peut causer des brûlures profondes, et son extraction des tissus cause souvent des dommages plus considérables. Toutefois, l'utilisation d'un des polysorbates (des agents tensioactifs) rend l'extraction facile et indolore.

Since burns from hot tar are uncommon, the methods of treatment are not well known. Furthermore, it is difficult to remove the tar without further damaging the skin. However, recent reports indicate that the use of the chemical agent polysorbate has made removal of the tar simple and painless.¹ Physicians unfamiliar with this

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method continue to have difficulties in treating a patient with hot tar burns, as illustrated by the following case.

Case report

A 22-year-old man, employed as a roofer, presented to the emergency department of our hospital 30 minutes after he had suffered a hot tar burn on his left hand (Fig. 1). As he was in considerable pain, morphine and diazepam were administered intravenously and the hand was immersed in cold water for 10 minutes. The congealed tar was peeled off, the dead skin was removed and the hand was dressed with amniotic membrane.² Despite the medication, the removal of the tar caused a fair amount of distress. Five days later, deep partial-thickness burns were evident on the dorsum; therefore, tangential excision and immediate skin grafting were performed with the patient under general anesthesia. Good functional and cosmetic results were obtained.

Discussion

Tar or asphalt, a residue of petroleum refining, is a dark brown or black, solid or semisolid cementitious material. It is composed of paraffinic and aromatic hydrocarbons and heterocyclic compounds containing sulfur, nitrogen and oxygen, and becomes a liquid when

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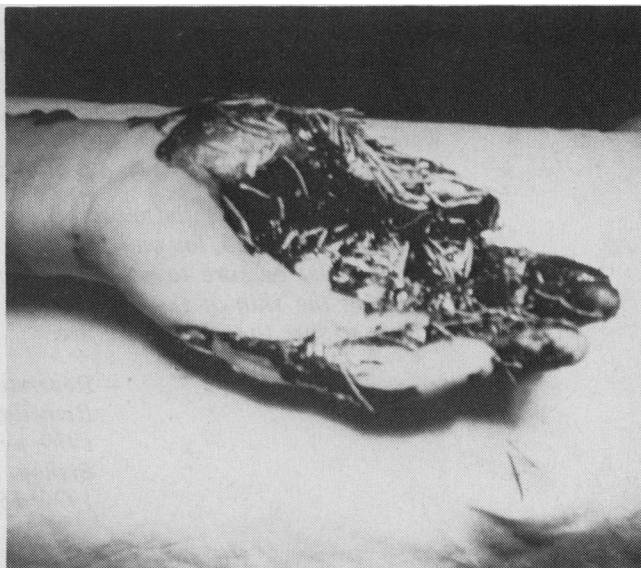


FIG. 1—Dorsal (left) and palmar (right) views of hot tar burn on left hand and wrist. Note mixture of grass and tar.

heated to 93°C. However, it is often heated to more than 232°C when used for roofing and paving.³ At this temperature molten tar causes deep burns, but two thirds of these burns involve only 3% to 5% of the body surface, and only one third involve 10% or greater.⁴

In the past, tar burns have been treated primarily by immersion in cold water or saline followed by manual débridement; however, this method, besides being painful, removes viable skin and marginal tissue extending the depth and area of the burn.^{1,4} Furthermore, immersion in cold water of areas with major burns has been found to be unnecessary and sometimes dangerous if done more than 10 minutes after the time of the burn. It can also promote hypothermia and its accompanying hazards.⁵ Immersion in cold water is probably useful only for patients with minor burns who present immediately after the accident; in these cases the tissue temperature will not have been reduced to body temperature by heat loss to the environment.

Liquid solvents such as kerosene, gasoline, acetone and alcohol have been found to be generally ineffective in removing tar and can damage the local tissues and occasionally produce systemic toxic effects from absorption.¹

Recently Neosporin (polymyxin B sulfate-neomycin sulfate-gramicidin) cream has been found to dissolve tar, thereby making removal easy. Its emulsifying agent, polyoxyethylene sorbitan, has excellent lyophilic and hydrophilic properties and thus is a very effective nonionic surface-active agent. The polysorbate lowers surface tension and promotes micelle formation at the cell surface, thereby clearing the bond between the cell surface and the adherent material; because of the polysorbate's hydrophilic action the emulsified tar can be washed off with water.⁶ Neosporin ointment (polymyxin B sulfate-zinc bacitracin-neomycin sulfate) with a petrolatum base also dissolves tar but is less effective than the cream, which has a polysorbate base.

Tween 80 (polyoxyethylene 20 sorbitan mono-oleate; the 80 refers to the average molecular weight of the polyethylene glycol polymer) is another readily available polysorbate that serves as an emulsifying agent and a dispersant in cosmetics and coal tar ointments used for treating skin disorders. Polysorbates are virtually non-toxic and have the lowest toxicity rating of all commercial products;⁷ they have been added to oral vitamin preparations to promote absorption. Oral administration of up to 40 g/d of polysorbate for long periods has been considered safe.¹

Débridement of tar or asphalt with polysorbate appears to be the method of choice as it is less painful and less destructive to the viable tissue. Liquid Tween 80 is preferable to Neosporin cream because the former is more water soluble and easily washable and can emulsify the tar in a shorter time. However, Neosporin has the advantage of being readily available in emergencies.

Both experienced and inexperienced workers can suffer hot tar burns. The preventive measures suggested by Schiller and Shuck⁴ cannot be understated in decreasing the incidence of this serious industrial hazard.

References

1. DEMLING RH, BUESTATTE WR, PERERA A: Management of hot tar burns. *J Trauma* 1980; 20: 242
2. BOSE B: Burn wound dressing with human amniotic membrane. *Ann R Coll Surg Engl* 1979; 61: 444-447
3. OTHMER DF, MCKETTA JJ, MARK HF: *Encyclopedia of Chemical Technology*, 2nd ed, vol 3, Wiley, New York, 1964: 284
4. SCHILLER WR, SHUCK JM: Treating tar burns (C). *Emergency Med* 1980; 12 (9): 18
5. PRUITT BA: The burn treatment. *Curr Probl Surg* 1979; 16: 5-8
6. FLORENCE AT: Surface chemical and micellar properties of drugs in solution. In OVERBECK JTG, PRINS W, ZETTMEOYER AC (eds): *Advances in Colloid Interface Science*, vol 2, Elsevier, Amsterdam, 1968: 115-146
7. GOSSELIN RE, HODGE HC, SMITH RP, GLEASON MN: *Clinical Toxicology of Commercial Products*, 4th ed, sect 2, Williams & Wilkins, Baltimore, 1976: 181

Ye old home remedies for burns

Take a pound of rusty bacon, stick it full of oats on every side as it will contain, put a thread through a corner and so hang it on a nail before ye fire and take a blazing stick and sett your bacon of fire and sett a bason of water under it, so let it drop into it, it will be very black when cold. Take it out of ye water and put it in a pott and so anoint ye burns with a plaister.

Beat an apple with salad oil until it is a poultice, pretty soft; bind it on the part and as it dried, lay on fresh.

You must be sure to pare, core and beat your apples well for fear of breaking the skin of the burn. But if the skin be off, there is nothing in nature so sure to take out the fire.

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